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THE
LARYNGOSCOPE.

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A REVIEW OF THE AVAILABLE LITERATURE ON THE PHARYNX AND PHARYNGEAL SURGERY FOR 1944.*

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In a paper emphasizing the dangers associated with the use of cocaine and pontocaine in the preparation of patients for transcricoid therapy, Derbes and Engelhardt[1] state that although a review of the literature indicates that fatalities following the use of these analgesics for pharyngeal anesthesia are not common, they were able to find five recent cases at Charity Hospital in New Orleans. One of these cases is briefly described and the pertinent data in the five cases are tabulated. The authors classify reactions following use of local anesthetics as hyperergic and allergic. The hyperergic reactions represent primarily involvement of the nervous and cardiovascular systems. Two possibilities exist regarding the allergic shock group: allergy is not a factor in producing the reaction, or the patient has been sensitized by previous exposure to a chemically related substance. Although no reliable method of foretelling sensitivity to pontocaine has yet been offered, the local anesthetic committee of the American Medical Association has made certain recommendations in an effort to reduce the number of fatalities to a minimum: procaine is the safest of the local anesthetics only if the concentration does not exceed 1 per cent; the total amount of cocaine should not exceed 0.06 to 0.1 gm.; and fatalities have been especially frequent when the urethra,

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scrotum and tonsils were anesthetized. The preoperative administration of the barbiturates has been shown to have some slight antidotal effect. Epinephrine added to the pontocaine solution will decrease the rate of adsorption of the drug. Although treatment of the severe reaction is of little benefit, cardiac massage, intracardiac injection of epinephrine and artificial respiration are usually tried. Sedatives should be given for convulsions.

In an attempt to demonstrate virus in the human nose and throat in cases of poliomyelitis, Howe and his co-workers[2] obtained throat swabs from 14 patients with the disease during the first week of the illness. They employed the following technique of inoculation: the throat swabs were eluted in phosphate buffer at pH 8, the fluid being pressed out of the cotton in a syringe; the eluate was then brought to pH 6 and treated with 20 per cent ether in the ice box until sterile when the ether was removed; under ether anesthesia a trephine hole was made over the sagittal suture just posterior to the coronal sutures in Rhesus monkeys, varying between eight and 10 pounds in weight; half of each inoculum was placed into each lateral thalamus. Of the 14 specimens, tested, seven (50 per cent) produced typical poliomyelitis in the test Rhesus monkeys; six of the seven animals were paralytic.

Rowbotham[3] describes a balloon which, when inflated, locks up blood and secretions in the nasopharynx and produces a gas-tight fit for the anesthetic tube. It consists of an inflatable rubber balloon built around a thin tube. This is slipped onto a Magill's tube and its position so adjusted that the balloon, lying in the pharynx, when inflated, pushes the soft palate back against the posterior pharyngeal wall. When it is laid alongside the patient's cheek with the proximal end of the tube at the teeth, the balloon will be correctly placed when it lies opposite the angle of the jaw. The method of employing the instrument is described by Rowbotham as follows: "Before intubation all air is withdrawn from the balloon and its small inflating tube clipped. Tube and balloon are smeared with lubricant and the distal end of the tube is passed into the trachea under direct vision. In order not to obscure the view of the glottis, it is often better to pass the

tube on the left side of the laryngoscope; usually it may be directed easily into the trachea, but in cases where this is difficult the end should be picked up by Magill's forceps and guided into position. After intubation it takes but a few seconds to inflate the balloon; time is saved and a secure barrier is produced which does not injure the mucous membrane of the throat. A small 'tell-tale' on the inflating tube indicates that the balloon is blown up."

Clift[4] describes a new applicator for irradiation of the Eustachian tube which eliminates some of the undesirable characteristics such as producing trauma on insertion and inability to determine whether or not the radium capsule is being maintained in position and minimizes discomfort to the patient. The applicator, which is 16.5 cm. long, consists of four parts: a brass capsule, which is capable of holding five 10 mg. needles or a 50 mg. capsule of radium; a shaft of silver wire; a handle one inch in length with one surface flattened; and a sliding stop which automatically locks at any position desired. The stop consists of a metal disk united to an ordinary tie pin clasp. After the applicator is inserted and the capsule rests in the proper position, the stop should be moved along the shaft until it rests against the nose, where it locks. It is held in place by a strip of adhesive tape. Any tendency for the applicator to slip out can be immediately detected. In practice the capsule is angulated slightly to the temporal side and with the flattening of the handle on one side, the position of the capsule can be checked at all times during the application.

Mountjoy[5] proposes a functional concept of the nasopharynx and presents some of the physiologic and pathologic responses of the nasopharynx to heat, cold and disease, together with some therapeutic considerations. He states that the end-result of chilling is the establishment of a fertile bed in which viruses and bacteria can grow and multiply. Drying of the nasopharynx results in fissuring of the mucous blanket and retardation or actual destruction of the ciliated epithelium which permits virus and bacteria invasion with the subsequent development of acute inflammation within the substance of the nasopharyngeal mucosa. Therapy for acute

nasopharyngitis should be directed toward the promotion of ventilation and drainage of both the nasal cavities and the sinuses; local therapeutic measures to the nasopharynx; general systemic therapeutic measures and medical or surgical eradication of the causative factors of nasopharyngitis.

Rickard, Thigpen and Crowley[6] report the results of studies undertaken in which chick embyros were inoculated with untreated and unfiltered throat-washings obtained from 75 normal persons, patients ill with sporadic febrile upper respiratory disease and from patients ill during epidemics of influenza. They observed that the nasopharyngeal washings obtained from persons with acute febrile upper respiratory disease, including influenza A, did not have to be filtered or treated with bacteriostatic agents to permit the direct inoculation of such material into embryonated eggs. Chick embryos continued to live in spite of being grossly contaminated with organisms from the human nasopharynx, and multiplication of influenza A virus appeared to proceed normally in the presence of these organisms. The authors describe a technique of intra-allantoic inoculation which requires no special skill or equipment. In a current epidemic, influenza A virus was isolated and identified in nine out of 20 throat-washings taken at random, four of which produced agglutination on primary egg inoculation. One of these four strains was identified as influenza A virus within 48 hours after the first cases in the epidemic were observed. Human sera of known titer for standard strains of influenza A and B virus were used for the identification of all the strains isolated.

Because techniques for postmortem examination of the nasopharynx previously described in the literature have the disadvantages of often being "protracted in procedure, requiring special instruments or giving rise to disfigurement of the head or rendering embalming impracticable," Szanto[7] describes in detail two new modifications of the technique for the removal of the nasopharynx at autopsy in which preservation of the connections with the organs of the throat may be accomplished. For routine autopsy he recommends a routine primary incision followed by careful dissection of the neck organs, isolation of the large blood vessels and ligation

of the superior thyroid, lingual, occipital and internal carotid arteries. An incision through the floor of the mouth is carried parallel with, but extending a few millimeters behind the mandible to avoid injury of the external maxillary artery. The tongue is pulled downward; the head is retroflexed, the hard palate is isolated from the alveolar process by a chisel incision or the soft palate alone is separated from the hard palate by a knife incision. The posterior wall of the esophagus and pharynx is separated from the vertebral column. The scalp is dissected forward to the supraorbital ridges and posteriorly to the occipital foramen. The external auditory meatus is severed subcutaneously and the skin drawn down to the zygomatic arch. The calvarium and brain are then removed. A frontal saw incision is made through the base of the skull in a line linking both external auditory meatuses or is affected a few millimeters beyond this line. Two frontal saw incisions are then joined by two sagittal saw incisions somewhat laterally from the cavernous sinuses. The specimen is then removed; it consists of the central segment of the sphenoid bone with the sella turcica and the sphenoid sinus, the nasopharynx, the posterior portion enclosing the nasal cavity, the entire pharynx and the upper part of the esophagus, the larynx, a portion of the trachea and the thyroid gland with the parathyroid glands. In those cases in which the nasal cavity proper is involved, a more complicated technique is recommended.

ABSCESS.

Weille and DeBlois[8] report a case of retropharyngeal abscess in a 32-year-old woman in whom there was easily observable edema of the larynx but no respiratory embarrassment; treated by the administration of sulfadiazine preoperatively, drainage of the abscess through an external incision and the use of sulfonamides postoperatively, the patient made a complete recovery. In describing the wall of the abscess cavity, the authors state that it was very thick and gave the "impression of an attempt by nature toward wide organization of the greater portion of the inflammatory swelling, failing only because *sulfonamide compounds will not affect undrained pus.*" In the past 15 years these authors

have seen 27 cases of retropharyngeal abscess, 13 of which were between the ages of six months and five years, eight between five and 15 years, and the remaining six, adults. Sixteen of the 27 patients were females. The mortality rate was 3.7 per cent. In regard to treatment, emphasis is placed on the importance of supplementing the oral intake of fluids by parenteral administration when sulfonamides are given for retropharyngeal inflammation since these patients often have difficulty in taking fluids by mouth. Lateral Roentgenograms of the neck will aid in determining the extent and the degree of swelling in pharyngomaxillary inflammation. The authors call attention to the fact that although the transoral approach is adequate in most cases of retropharyngeal abscess, external drainage may be necessary, as in the case reported.

ANATOMY AND HISTOLOGY.

Brandenburg[9] made a study of the pharyngoesophageal segment of 41 bodies directed to the muscular coat surrounding the esophagus with special attention to the esophageal triangle located below the cricopharyngeus. He noted that the pharyngoesophageal segment was firmly attached to the structures anteriorly and adhered posteriorly to the cervical portion of the vertebral structures only by loose areolar tissue. Most of the inferior constrictor fibres ascended obliquely and inserted into the median raphe. The most inferior fibres coursed horizontally and decussated with those of the opposite side, but a few looped around and attached themselves to the esophagus; the remaining fibres had a scattered and very indefinite course. The cricopharyngeus varied in width from 2 to 6 cm. and varied greatly in thickness. Gross inspection of the structures above the cricopharyngeus including the mucosa, pharyngeal aponeurosis and muscle fibres showed them to be much firmer and thicker to palpation than those below. The longitudinal bands of the esophagus arose by means of the elastic ligament from the cricoid cartilage and descended obliquely on each side, spreading out to encircle the upper end and united below at varying distances on the posterior surface of the esophagus. The direction of their fibre arrangement was opposite that of the pharyngeal muscles. Brandenburg stated that these dissections clearly dem-

onstrate that the structure, as well as the distribution of the muscle bands over the posterior surface of the esophagus causes a distinct variation in the muscular protection of the pharyngoesophageal segment. From this study he concluded that "pulsion diverticulum of the esophagus may be said to bear the same direct relationship to congenital muscular variations of the pharyngoesophageal segment and variations in Laimer's triangle as does inguinal hernia to the triangle of Hesselbach. Here, also, there may be not only a variation in the number of muscle fibres attaching into the tendon of Gillette but a variation in the distribution, quality and number of muscle fibres diverging over the posterior surface of the esophagus. This muscle fibre diversity results in alterations of size, shape and configuration of Laimer's triangle, thus making it, as is the triangle of Hesselbach, a vulnerable point for herniation."

Evans [10] suggests a fourth subdivision to the recognized areas of the human pharynx: the esophagopharynx. He considers this a separate structural entity. Its function is "chiefly to support the upper ostium of the esophagus against which the bolus is forced and to close down in a sphincteric manner upon the bolus as it is received within the tube of the esophagus. There may be additional actions, related to the support of the cricoid cartilage."

BACTERIOLOGY.

Cruickshank[11] reports the results of a study of 250 consecutive patients admitted to the North Western Hospital with a diagnosis of whooping cough during the period from January, 1942, to August, 1943, in whom postnasal swabs were taken and cough-plates exposed within a few days of admission. Specimens taken between Nov. 24, 1942, and March 18, 1943, were omitted because penicillin was not available during that period. Only 36 per cent of the patients yielded positive cultures on admission. Considering the number of failures to isolate the organism and the proportion of misdiagnosed cases, this finding meant that over 50 per cent of the patients with whooping cough were admitted to the hospital after they had ceased to be infectious. Of the 90

positive results, the proportion positive by either cough-plate or postnasal swab was about the same; each missed about 25 to 30 per cent of the total positives. The method for bacteriologic diagnosis was to take a nasopharyngeal swab through the mouth and inoculate it on a "penicillin plate" or Border-Gengou medium. The author noted that providing the swab was kept moist, H. pertussis seemed to remain viable for 24 hours. Although the author got the impression that the swab-plate was superior to the cough-plate in the isolation of the organism from younger children, analysis did not bear this out.

A report on the frequency of group B hemolytic streptococci in the human nasopharynx, directed by the Medical Research Council, was made in the Monthly Bulletin, Ministry of Health and Emergency Public Health Laboratory Service.[12] Little is found in the literature on this subject. In England, one author found that five of 100 strains from the nose and throat of normal persons belonged to group B; in Canada, 75 of 294 strains, and in China, two of 256 strains from normal throats belonged to that group. In the Canadian report there were none in 157 strains from diseased throats, and an English author found none in 94 diseased throats. Two of 8,096 strains from scarlatina patients in various countries have been recorded as belonging to group B. In 132 strains of hemolytic streptococci taken from the nasopharynx of normal and diseased throats, the Emergency Laboratory Service at Oxford did not identify one group B strain. During 14 months, 1,283 strains of hemolytic streptococci were studied at the Cardiff Laboratory; only one belonged to group B. Although there is not enough information on the normal human nasopharynx to justify any reliable conclusions on the frequency of group B streptococci, in the diseased throat the available data suggest that they are very infrequent.

Miller, Beadenkopf, Peck and Robbins[13] report their findings in a continuous study of meningococcus carriers among the staff, nurses, attendants and orderlies in the wards, clerks, stenographers, technicians and laboratory helpers at the Albert Merritt Billings Hospital carried out over a period of 17 months. Of 1,236 individuals on whom 2,360 cultures

were made, 82 were found to be harboring meningococcus in the nasopharynx; 48 of these were men and 34 women. None of the carriers had had any known contact with cases of meningococcal meningitis. Classification of the carriers by occupation showed only the unskilled laboratory helpers to contain a somewhat higher proportion than the average. Five of the carriers worked in the laboratory where the survey was carried out, but the authors present evidence to suggest that this finding was purely coincidental. The carrier rate varied with the season; the highest incidence was in April and May with a maximum of 17 per cent. Seventy carrier strains could be typed by agglutination, 49 of which belonged to one of the recognized types: type I, 16 cases; type II, 26 cases, and type II alpha, seven cases; the remaining 20 fell into one of three groups designated X, Y and Z on the basis of cross-agglutination by serums prepared from 11 of the carrier strains. Of 11 strains belonging to type I, none was virulent as tested in white mice by the mucin method; two-thirds of the type II strains were virulent and just over half of the type II alpha strains were virulent. Lack of invasiveness on the part of the carrier strains was suggested by the fact that nasopharyngeal cultures of the spouses of a number of carriers revealed a few carriers but none with a strain of the same type as the spouse. Of the few carriers who were cultured repeatedly over a long period, the persistence of the carrier rate varied considerably; usually it was either constant or intermittent. Cultures of the visible portion of the pharynx contained few meningococci even when the nasopharynx yielded almost pure cultures. Regional cultures made in an attempt to locate the most heavily infected area were inconclusive. The effect of intercurrent respiratory infections was inconsistent.

Phair and Schoenbach[14] report the findings of an investigation formulated by the Commission on Meningococcal Meningitis: "*a.* to describe the dynamics of subclinical meningococcal infections, according to type, in respect to distribution, prevalence, incidence and duration; and *b.* to determine the minimal effective dose of sulfonamides required to obtain parasitic cure of these infections. The size of the samples,

the intervals between cultures, and the techniques employed were so planned as to furnish valid answers." The material for the study comprised a group chosen at random from an army medical service. unit. Cultures were done regularly three times a week for 10 weeks. The following aspects of the dynamics of meningococcal infection among the group studied were noted. The average composite prevalence rate was 40 per cent. Of the 99 men in the group, 92.9 per cent were infected at some time during the study; of these, 44 had persistent infections and 48, transient infections. There appeared to be no correlation between the daily prevalence rates, climatic conditions, the occurrence of upper respiratory diseases and the incidence of the common contagious diseases, including clinical meningococcal infections. Of the subclinical infections, 53.5 per cent were group I, 38.4 per cent type IIa, and 40.4 per cent group II. The authors believe that the high proportion of the men infected confirmed the concept that the meningococcus spreads primarily at the subclinical level. The experiences of the commission during the past two years suggest that the number of cases will be determined by the incidence of new infections rather than the prevalence in any given period. It was found that the administration of the sulfonamides offers a feasible method of rapidly decreasing the prevalence of meningococcal infections in any limited group; it was inferred that parasitic cure was obtained with two or more grams of sulfadiazine. The information obtained from this analysis is tabulated in detail and represented graphically in charts.

CANCER.

Thompson and Grimes[15] present an analysis of the clinical and pathologic characteristics of 17 personally proved cases of carcinoma of the pharynx in the hope that it will stimulate reports from other clinics. The average mean age in their series was 38.8 years. Fifteen of the 17 patients were men. The racial distribution was two Chinese, four negroes and eleven whites. All 17 patients had cervical lymph node metastases on admission. Three complained chiefly of epistaxis; 10 others eventually complained of this symptom. Tinnitus or deafness eventually developed in 13 cases. Signs of cranial

nerve involvement were evident in nine. The average length of time from the onset of the first symptom until the diagnosis was made was 8.1 months. Only two of the 17 patients were alive at the time of the report; in the other cases the average length of life following the first symptom was 23.4 months. These patients were treated with varying amounts of irradiation, which is the only accepted form of treatment once the diagnosis is proved, according to these authors. The tumors in this series of cases fell into three groups. The pathologic description of these is given. A detailed analysis of the 17 cases is included in tabulated form.

Malignant tumors of the epipharynx with involvement of the optic nerve rarely occur. Epipharyngeal tumors may grow along the Eustachian tube, into the skull and advance along the great wing of the sphenoid toward the optic canal and involve the opticus in this way. Folk[16] describes two cases of malignant tumors of the epipharynx with involvement of the optic nerve, in one of which the optic nerve was involved in the following manner. A malignant sarcoma invaded both "sphenoid sinuses and after destroying the lateral wall of these sinuses penetrated the optic canal so that the optic nerve was almost completely surrounded by tumor tissue. The tumor then advanced toward the superior orbital fissure." In this case the optic nerve was almost entirely surrounded by tumor tissue; only the roof of the optic canal was still present although pathologically changed. Folk stated that microscopically it showed that the optic nerve could easily be damaged by pressure of the tumor toward the roof of the optic canal and not by sarcomatous infiltration, if the nerve were to be impaired at all.

In a general discussion of malignant lesions of the face, nose, mouth and pharynx, Robertson[17] states that although these conditions are frequently painless in the beginning, they later become intolerably painful. When life expectation is short, analgesics are recommended. Pain may be relieved by destruction of the trigeminal, glossopharyngeal and upper cervical nerves, depending upon the location of the pain. Alcohol block is seldom satisfactory and Gasserian ganglion block entails certain risks, but section of the sensory root

proximal to the Gasserian ganglion produces permanent relief and is safe in all but the very ill. Although immediate relief may be obtained by these methods, the lesion may progress to involve new nerves and require further treatment. The author states that the most difficult cases are those arising posteriorly in the floor of the mouth and in the related areas of the jaw and tongue, where a relatively small lesion may involve trigeminal, glossopharyngeal and cervical nerves. All of these nerves can be sectioned by combined suboccipital craniectomy and high laminectomy in one or two stages. If the patient is very ill, trigeminal section by the temporal route or alcohol block and resection of the cervical nerves in the neck may be performed. Although there is no evidence that tumor growth is affected by denervation of the surrounding tissues, insensitive tissues are more liable to injury and infection is more likely.

Cutler[18] presents a report of progress of results of concentration radiotherapy. Between April, 1938, and April, 1943, 290 cases were treated. After numerous variations in technique of external irradiation were tried, several methods have evolved which seem to be most effective; a different technique is used for different types of lesions. Telecurietherapy, 12 treatment days, single constant portal, dose 120,000 mg.-hr., is used in lesions of the alveolar ridge and floor of the mouth in which the disease is entirely or mainly unilateral. Roentgen therapy, 11 treatment days, two constant portals, dose 8,400 r, is employed in lesions of the soft and hard palate. For intrinsic carcinoma of the larynx affecting the true or false cord or both structures in which for various reasons it is decided to use radiotherapy, Roentgen therapy, 11 treatment days, single diminishing portal, dose 5,400 r, is used. Roentgen therapy, interrupted method, 10 treatment days, two fields, diminishing portals, dose 7,700 r, is utilized in more advanced intrinsic carcinoma of the larynx in which the advantages of the therapeutic test are desired. Roentgen therapy, 18 treatment days, single diminishing portal, dose 6,500 r, is employed in extrinsic carcinoma of the larynx. The basis of the method of concentration is the use of large daily doses over a comparatively short treatment period. The

number of patients in this series receiving the concentration method of radiotherapy alive at the end of five years were as follows: 40 of 57 with carcinoma of the larynx; 35 of 58 with carcinoma of the larynx and hypopharynx; 64 of 116 cases of carcinoma of the mouth, oropharynx and nasopharynx excluding the tongue; 17 of 38 cases of carcinoma of the tongue; and 11 of 20 cases of carcinoma of the accessory nasal sinuses. Cutler states that as a result of this new method of treatment "the initial disappearance and apparent cures have been observed in a group of intrinsic squamous carcinomas of the larynx which are generally regarded as radioresistant and for which surgery is usually claimed to be the only effective method of treatment. In many of these cases the only alternative to radiotherapy was complete laryngectomy." Cutler suggests a radiotherapeutic test to be used in borderline cases of intrinsic carcinoma of the larynx which gives the patient a chance of cure with preservation of his voice if the lesion proves to be radiosensitive and does not eliminate his chances of cure by laryngectomy if the lesion proves to be radioresistant. This consists in giving about half the full dose in six days, followed by an interval of 15 days of observation. The degree of regression of the lesion at the end of the 21 days can be used as a reasonably accurate index of the radiocurability of the lesion.

Hechavarria[19] reports the case of a 52-year-old man with an epithelioma of the right pyriform sinus treated by transhyoid pharyngectomy according to the technique of Wilfred Trotter Colledge; this technique provides excellent exposure of the region of the oro- and hypopharynx, making accessible all the buccopharyngeal and laryngopharyngeal lesions. The author believes that with this technique can be treated malignant lesions which, because of their histologic structure, cannot be benefited by radiation. In the case reported the tumor was an infiltrating ulcerative lesion situated on the external wall of the right pyriform sinus about 1.5 x 2 cm. in size. In the right submaxillary region and near the angle of the inferior maxillary could be palpated an infarcted ganglion, round in contour, about the size of a dove's egg, and slightly adherent to the deep tissues and covered by apparently nor-

mal skin. In the carotid region on the same side could be palpated three infarcted ganglia which were round in contour and of variable size. The postoperative course was uneventful and the wound healed by the tenth day. Complementary radiotherapy was given; however, when the patient was seen two months after operation, metastasis was evident.

Because of the conflicting results of the effect of radiation on the ear reported following clinical and experimental studies, Perlman[20] made some studies on a group of carefully selected cases and on carefully controlled animal experiments, including tests for auditory function, to determine the effect of radiation on the normal, the pathologic and the injured ear. No detrimental effect on the structure or function of the peripheral auditory system was observed in the normal human ear exposed to very heavy tumor doses of X-rays delivered at not over 15 R per minute and 300 R per day. Experiments on ears of healthy young rabbits exposed to measured amounts of X-ray corroborated the clinical findings that exposure of the cochlea to large amounts of radiation produced no objective or subjective change in the peripheral auditory mechanism. It was noted that conduction deafness due to long-standing severe tubal obstruction and associated middle ear changes of exudative catarrh associated with carcinoma of the nasopharynx could be completely reversed by radiation in patients. The only cellular injury was impairment of the function of the secretory cells and this probably extended to involve the secretory cells in the glands along the Eustachian tube. No detrimental effect on the various structures of the peripheral auditory apparatus could be found. Only temporary delay in the healing of a clean perforation of the cochlea of the rabbit was obtained by radiation with 1,500 units to 5,000 units of X-ray. No permanent arrest of osteogenesis could be obtained by radiation with 1,500 units of X-rays, and one year after radiation the perforation was found to be completely closed by new bone.

In an article on general considerations in the treatment of oropharyngeal neoplasms, Rosh[21] states that the modern treatment of carcinoma of the oropharynx including the tongue, tonsil and cheek with its complicating malignant cervical lymphadenopathy is by a combination of radium, high voltage

X-ray therapy and surgery. Radiation has long been recognized as an important means of treating these tumors with surgical measures as supplementary. Because reactions may be dangerous, "frequent examination of the patient undergoing irradiation is the guide to proper management of therapy." Rosh estimates the mortality rate of these lesions as about 75 per cent and considers as chief factors accounting for preventable fatalities: *1.* failure to recognize and eradicate precancerous lesions; *2.* failure to identify epitheliomas at a sufficiently early stage; *3.* temporizing with continued use of caustics in cases of doubtful lesions; *4.* errors in biopsy conclusions; *5.* procrastination in cases of small but fully established malignant growths; and *6.* inadequate treatment of the tumor and metastatic areas. Rosh considers epitheliomas of the tonsillar region the easiest to treat and those of the hypopharynx the most difficult. He estimates the five-year survival rate for tonsillar lesions as about 30 per cent and for the larynx about 10 to 12 per cent.

DIPHTHERIA.

A study in which simultaneous nasal and pharyngeal cultures were taken in 733 children with evident clinical pharyngeal or nasal infections, or both, was undertaken by Blanco and Raggio.[22] Nose and throat exudates were taken with a cotton swab of adequate size. Of 157 cases of nasal infection, 65 (41.41 per cent) gave positive nose and throat cultures without visible pharyngeal exudate. Of 576 pharyngeal infections with visible exudate, 163 (28.29 per cent) gave both positive cultures. Or, of the total of 733 cases, 228 (31.1 per cent) gave both positive cultures. The authors believe that in all suspected cases of rhinitis, it is useful to take simultaneous nasal and pharyngeal cultures; in cases of rhinitis with concomitant angina, it is even more helpful. From their study the authors concluded that simultaneous nasal and pharyngeal bacteriologic examination permits a more rapid and exact diagnosis and easy and immediate treatment in a great number of suspected cases.

DISEASES.

Kraemer[23] presents a study of 102 cases of follicular ton-

sillitis and 13 cases of follicular pharyngitis seen at the Station Hospital, Grand Rapids, between April 20 and June 20, 1943. Forty of the patients received sulfadiazine in total dosage varying from 3 to 24 gm. with an average dose of 13.5 gm. The average small dosage was due to the fact that so many were afebrile within 24 hours so that the drug was discontinued before any effective dosage could have been administered. The remaining 75 patients were treated symptomatically. The average hospital stay in the sulfadiazine treated group was 5.35 days and in the symptomatically treated group was 5.4 days. Complications were about the same for both groups. Kraemer concluded that "sulfa drugs should not be routinely used in self-limiting bacterially produced diseases of the upper respiratory tract."

During a period of 18 years, Murphy[24] had observed 17 cases of a neuropharyngeal syndrome consisting of herpetic lesions in the pharynx and mouth accompanied by pain in the ear and occipital regions and an area of paresthesia in the parietal region. Within six weeks, 20 additional cases occurred during an epidemic of keratoconjunctivitis. A possible virus origin was suspected. Cultures from the throat were taken in all cases and no pathogenic organisms were found. In cases in which contacts could be traced, the incubation period was from five to seven days. The ages in the series ranged from 22 to 56 years. The condition was highly contagious — four cases appeared in one family. The average duration of the syndrome was 12 days. Treatment was palliative and consisted of acetophenetidin and acid acetyl salicylic with codeine phosphate for pain, mild alkaline irrigations plus the application of dye antiseptics to the pharyngeal lesions and large doses of vitamin B_1. The sulfonamides did not affect the course of the disease.

Iriarte[25] reports a case of pharyngomycosis in a patient 30 years of age who complained of tickling and discomfort in the throat. Examination of the pharynx disclosed a number of white spots, about the size of a grain of rice, which were hard and protruding from the crypts of both tonsils. A diagnosis of mycotic pharyngitis was later substantiated by direct examination of the white patches after cultural growth

on Sabouraud media at the end of 48 hours. Tonsillectomy was performed. Histopathologic examination of one of the tonsils revealed no abnormalities.

Gettelman and Kaiz[26] attempted to evaluate the effect of sulfa therapy in acute pharyngotonsillitis in a study of 250 cases admitted to sick list during two winter months. Only cases in which the presence of patchy or membranous exudate either on tonsils or on islands of lymphoid tissue in the pharynx were included. The cases were divided into three groups: *1.* chemotherapy withheld throughout the illness; *2.* sulfonamides given after a period of observation, bed rest, fluids in abundance, aspirin and phenacetin compound tablets; and *3.* sulfonamides given early in the illness. In group I (15 cases) the average duration of elevated temperature was 77.6 hours and the average stay in sick bay was 109 hours; in group II (25 cases) the average duration of elevated temperature was 60 hours and the average stay in sick bay was 95 hours, whereas in group III (150 cases) the average duration of elevated temperature was 28.8 hours and the average stay in sick bay was 55.7 hours. The authors noted that ". . . in the vast majority of cases, sore throat, the patient's one outstanding complaint, was alleviated so quickly as to leave no doubt of the effectiveness of the drugs." The lowest effective dosage was found to consist of an initial dose of 30 gr. of sulfathiazole or sulfanilamide, followed by 7.7 gr. of sulfathiazole (10 gr. sulfanilamide) every four hours, omitting the 2:00 A.M. dose. Toxic effects were infrequent, the most common being cyanosis following use of sulfanilamide.

Kuttner and Krumwiede[27] report their observations covering a six-year period on the incidence of carriers of various group A streptococci and their relation to the occurrence of outbreaks of streptococcal pharyngitis among groups of rheumatic children under close observation in a sanatorium. Major and minor outbreaks are described. During the four winters between 1938 and 1942, when outbreaks of streptococcic pharyngitis due to group A streptococcus of single types occurred, no rise in the carrier rate of the epidemic type preceded the appearance of cases. In the epidemics due to

types 4 and 27, the incidence of "contact" carriers rose slowly and only reached a peak during the month when the greatest number of cases occurred. In the outbreaks due to type 15 and type 36, in each instance, only two children among those who were not receiving sulfonamide prophylaxis became "contact" carriers after the epidemic had started. Except for the epidemic caused by type 36, when a temporary rise occurred during the first month of the outbreak, the carrier rates of miscellaneous group A streptococcus were falling at the time that the epidemics began. During the winters of 1937-1938 and 1942-1943, a small number of streptococcic pharyngitis occurred in the community. Infections were caused by spread of types derived from known carriers who had been in the community for several months. These strains first spread to other children who became contact carriers. Subsequently, pharyngitis due to these types developed in a few children. During 1937-1938, 12 cases of pharyngitis were caused by type 32 streptococcus and during 1942-1943, two cases of type 19 and six by type 37. Between 1938 and 1943, 102 of the 348 "new" children were "healthy" carriers of group A streptococcus. Fifty per cent of the 102 "healthy" carriers harbored streptococcus for two months or longer while under observation. The authors noted that sporadic cases arose directly from carriers and were not preceded by dissemination of the streptococcus to healthy individuals. Twenty-nine per cent of the children admitted during the summer and fall months were carriers of group A hemolytic streptococcus. The length of the carrier state seemed to have no relation to the presence or absence of tonsils.

Although no definite proof is available, Kuttner and Lenert's[28] observations over a period of six years suggest that repeated attacks of streptococcic pharyngitis occurring in the same person are usually due to group A streptococcus of different types. These authors state that the fact that reinfection with the same type was never observed suggests that type-specific immunity may develop; serologic evidence of such immunity is meager. From their study, Kuttner and Lenert noted that the development of bacteriostatic properties in the blood of patients following recovery from strepto-

coccic pharyngitis due to a single type of group A hemolytic streptococcus, type 36, persisted for many months and in some instances was still demonstrable a year after the upper respiratory infection. It developed in both mild and severe cases and occurred both in patients who did or did not develop rheumatic sequels. Bacteriostatic tests failed to elucidate the nature of the resistance to streptococcic pharyngitis of persons who did not develop infection.

Kelly[29] attempted to follow the bacteriologic changes occurring in the tonsillar regions of monkeys when necrotic tissue is substituted for the healthy oropharyngeal mucous membrane, and when such artificially produced lesions are maintained for relatively long periods. Special attention was given to the anaerobic flora under such conditions and it was hoped that some light might be thrown on the rôle they play in necrotic lesions. Alpha streptococci, neisseria, diphtheroids, diplococcus, staphylococcus, gamma streptococci, actinomyces, fusiform bacilli and spirochetes were found as normal flora on the tonsillar mucous membrane. Twenty-four hours after cautery the area was swollen and hyperemic; by the second day the injured spot was covered with a firm, though loosely adhering, creamy or grayish white membrane which usually became soft and ragged on the third day. The lesion healed in about four days. The transition from healthy mucous membrane to necrotic tissue in the oropharynx showed an increase in the total number of organisms; anaerobes increased, whereas aerobes declined and rod forms replaced the cocci as the most common bacteria in the tonsillar region; fusiform bacilli became abundant. Early in the lesion there appeared a hitherto unobserved vibrio which became at some time the predominating form in necrotic specimens from eight of the 10 monkeys. In general, cultures agreed with direct microscopic examination except that the "crescent fusiform" was never recognized in cultures and instead of the vibrio prominent in the smears, a strictly anaerobic, Gram negative, pleomorphic spirillum appeared for the first time on blood agar plates. The proportion of gamma streptococci increased; diphtheroids were generally more common. Subcutaneous implantation of bits of the necrotic membranes

produced abscesses in rabbits; cultures showed cocci. Pure cultures of spirillum had no effect on the animal. Guinea pigs sufficiently depleted of vitamin C reacted to the organism; in most of the animals the organism provoked local inflammation over an area of about 1 cm. in 24 to 48 hours. The results of this study indicate that local tissue injury is not in itself sufficient to increase the pathogenicity of organisms normally living in the monkey's buccal cavity.

Crowe[30] believes that men with aerosinusitis or aerootitis can be greatly helped by two simple and practical methods of treatment: local application of a sulfadiazine solution in the nose and nasopharynx to discourage the growth of bacteria and beta and gamma irradiation of the pharynx and nasopharynx to remove hyperplastic tissue. One-half medicine dropperful of 2.5 per cent sulfadiazine in ethanolamines is dropped into each nostril and allowed to flow backward along the floor of the nose into the nasopharynx and pharynx, repeated 10 to 12 times a day for three days and four to six times a day for another week. Crowe used this treatment to prevent ear and sinus complications of acute colds in about 1,500 patients during the past three years with results far better than from any other method. The treatment with sulfadiazine gives only temporary relief; the hyperplastic lymphoid tissue must be destroyed by irradiation which inhibits mitosis in the germinal centers and thus stops the formation of new lymphocytes, leaving the nasopharynx covered with smooth mucous membrane not unlike that on the nasal septum. Crowe states that the exact dosage gives a perfect result and there is never a recurrence. Because tyrothricin is truly bactericidal, whereas penicillin and the sulfonamides are bacteriostatic, Crowe believes it is better to use tyrothricin to irrigate an acutely infected antrum, to fill the canal following paracentesis and to wash the wound and surrounding soft parts after every sinus and mastoid operation. Crowe points out that crude penicillin can be made easily and inexpensively by inoculating suitable liquid culture media with spores from stock cultures of penicillium notatum and keeping the inoculated flasks at room temperature until pH and titration tests indicate the antibacterial activity has reached its peak. Crude penicillin is often very effective for local

application, especially since the available supply of sodium or calcium salts of penicillin for intramuscular and intravenous injection is still somewhat limited.

The Commission on Acute Respiratory Diseases[31] report their findings in a study undertaken to investigate the etiology and clinical characteristics of cases of exudative tonsillitis and pharyngitis, especially with regard to the importance of beta-hemolytic streptococci. One hundred sixteen hospital patients having exudate in the pharynx or on the tonsils at the time of the initial examination were studied. The beta-hemolytic streptococci were found in 50 per cent of the cases studied. This frequency is from three to five times greater than has been found in a normal population of the same age group in patients with respiratory disease without pharyngeal exudate. In the cases in which beta-hemolytic streptococci were found, 25 per cent had beta-hemolytic streptococci and exhibited a rise in titer of streptococcus antibodies during convalescence, 25 per cent had streptococcus but did not develop antibodies. Fifty per cent of the patients had no streptococcus. It was noted that there were definite differences between cases with antibodies and those without, in regard to mode and rapidity of onset, total frequency of symptoms, severity of certain physical signs and leucocyte count. Cases with betahemolytic streptococci in which antibodies did not develop were found to be similar clinically to cases which did not exhibit streptococci. From this study the conclusion was drawn that in the majority of the cases without streptococcus antibodies the streptococci were not the primary cause of the exudate in the throat and may have had no more relation to the infection than any of the other bacteria normally present. The commission further concluded that in about 25 per cent of the cases studied the exudate was caused by beta-hemolytic streptococci whereas in 75 per cent of the cases the cause was unknown.

In a general discussion on the diagnosis and treatment of glossopharyngeal neuralgia, Love[32] calls attention to the fact that there is no specific treatment for this disease. Sedatives should be given for the neuralgia and morphine may be necessary for the pain but should be given with care to avoid

addiction since the disease is chronic. Love considers the treatment of choice intracranial section of the involved IXth cranial nerve above the point where it enters the jugular foramen. Numbness of the throat and paralysis of the stylopharyngeus muscle, which follow the operation, do not usually bother the patient. There also may be slight deviation of the uvula from the midline, but this does not disturb the patient either. Alcohol injection is not recommended because the IXth cranial nerve is not suitable for injection because of its relationship to the great vessels of the neck and to the Xth and XIth cranial nerves; diffusion of alcohol might cause severe complications. Peripheral avulsion is a tedious, time-consuming operation; if permanent relief is to be obtained, the nerve must be divided between the superior ganglion and the medulla. Love reports a case of a 29-year-old patient with glossopharyngeal neuralgia treated by intracranial section of the IXth nerve with no recurrence after seven years. The youthfulness of the patient was an unusual feature, since the disease is one of the middle-aged or aged.

Ballenger[33] made a study of 500 patients with acute nasopharyngitis treated during a period of eight months by spraying a minimum of a 2 per cent aqueous solution of ephedrine hydrochloride to shrink the tissue of the turbinates and nostrils; blowing powdered sulfathiazole into the nasal cavities, nasopharynx and pharynx until covered with a dry, chalky film, during which time the patient has been inhaling slowly through the nose; blowing the powder behind the palate into the nasopharynx with the tip of the powder blower turned upward; insufflating a small amount into the laryngopharynx with the tip turned downward with a standard DeVilbiss powder blower with the small tip extension removed. He concluded that by this treatment the course of acute infection was shortened and the incidence of complications was diminished. In the series, three patients manifested possible sensitivity to the drug when a rash developed around the nose or face which lasted about 24 hours. Use of the sulfonamides has the disadvantages of possible allergic reactions, possible effects on the ciliary activity of the mucosa and possible creation of a sulfonamide resistant organism. Soluble sodium

sulfathiazole (25 per cent) combined with desoxyephedrine (0.125 per cent) is the derivative usually used in the treatment of upper respiratory tract infections. Two objections to sodium sulfathiazole are that the solution may remain in contact with the nasopharyngeal mucosa too short a time to be of benefit and the alkalinity of sodium sulfathiazole is almost twice that of the nasal mucosa.

Keith and Thompson[34] made a study of the effect of sulfadiazine in the treatment of 2,000 cases of scarlet fever or acute nasopharyngitis. The investigation was carried out in two main groups: in group 1 were 1,000 men living in three barracks blocks; two blocks were used as controls and one block was treated with sulfadiazine. One gram of sulfadiazine was given daily for two weeks in one dose at the noon meal. The hospital admissions for scarlet fever and acute nasopharyngitis in the three blocks were then compared. Admissions were greatly reduced in the treated group. The second 1,000 men living in three barracks blocks were divided into two groups of 500 each. Every other man was given 1 gm. of sulfadiaizne at the noon meal each day for three weeks; the others were used as controls. The hospital admissions as well as sick bay visitors were noticeably reduced in the treated group. No definite signs of sulfa-sensitivity were encountered in the study. Four hundred seven patients were tested for sulfadiazine sensitivity before the drug was given; only two were positive and neither of these knew of having received sulfadiazine previously, nor did they have allergic histories. Sulfadiazine was given without ill effects to three patients who gave doubtful reactions. Keith and Thompson believe that sulfadiazine prophylaxis is probably the most effective measure we have at our disposal at the present time to reduce the incidence of hemolytic streptococcic infections in service personnel and should be employed in conjunction with other hygienic measures. Because of the possible (although rare) toxic reactions, they state that the widespread use of the drug would appear necessary only in large epidemics when the hemolytic streptococci are particularly rampant.

Hollender[35] concluded from a study of 100 cases of naso-

pharyngitis treated with sulfa powder during the past year and a half that this treatment appears to be effective in relieving the symptoms more promptly and in shortening the course of the disease. Sulfathiazole appeared to be the most effective derivative. The treatment consisted of shrinking the membrane and then insufflating the powder with a compressed air powder blower. Toxic reactions were not observed, although two patients exhibited sensitivity to the drug. The procedure is not uncomfortable to the patient. Three or four insufflations are sufficient in acute cases but a number of treatments may be necessary in chronic cases and should be given at intervals of several days. Although most acute infections of the nasopharynx are usually self-limited, when symptoms are very uncomfortable or persist, relief may be obtained by this method.

Laub[36] describes a kind of pharyngitis caused by an increase in the venous pressure or a slow-down of the general circulation which is cured by restoring the blood flow to normal and bringing a normal amount of oxygen to the cells. He was not able to find any reference in the Surgeon General's library to cases of pharyngitis from this cause. Examination of these patients will show the mucous membrane of the throat to be slightly cyanotic without any signs of an acute infection although the onset is acute; the nose and upper respiratory tract are normal; occasionally the veins under the tongue and in the throat are enlarged. An early stage of decompensation of the circulatory system may be discovered on examination. Three illustrative cases are briefly described.

DIVERTICULA.

In a general article on pharyngoesophageal diverticula, Kulvin[37] discusses the relation and structure, classification, symptoms, diagnosis, differential diagnosis and treatment of the condition and reports five cases. Symptoms manifested by the patients in the cases reported were pain, coughing, belching, fullness in the neck after eating, difficulty in clearing the throat, difficulty in taking liquids and loss of weight. Other symptoms which may occur are hoarseness and ptosis. The diagnosis may be made from the clinical history and the

Roentgenographic and fluoroscopic findings. The condition must be differentiated from carcinoma of the hypopharynx and upper esophagus and stenosis of the esophagus, hysteria, acute and chronic infections. Treatment is surgical; conservative measures should be reserved for very old patients and for cases of diverticula of the esophagus below the clavicle. The one- and two-stage procedures each have their advocates. Four of the five cases reported had the one-stage operation. In only one case was there any complication of the operation — this was a low grade infection in the wound.

In a similar article, Strode[38] presents a general discussion of pharyngoesophageal diverticula and reports two cases in men 75 and 51 years old, respectively, who were relieved of symptoms following the two-stage operation. Strode states that the only treatment is surgical and advises the two-stage operation because it is less frequently complicated by mediastinitis.

PARALYSIS.

Vincent's angina of a severe type with typical lesions of the throat, extreme dysphagia, pronounced fetor oris, evident submaxillary and cervical lymphadenopathy and hemoptysis but without obvious involvement of the gums in two German prisoners of war, 21 and 22 years of age, is described by Ross.[39] Although the diagnosis was not definitely established, the clinical and laboratory evidence was overwhelming in its favor. Both cases were complicated by late partial pharyngeal paralysis. Although no explanation of the mechanism involved could be found, Ross offers as possible explanations: allergic response to the original infection; some endotoxins or exotoxins might have affected the muscle and nerve fibres; some simple mechanical physiologic hindrance produced by extracellular and/or intracellular infiltration and edema. Ross believes that this might represent two disease entities, interdependent or separate, or a peculiar throat syndrome with various factors involved, some secondary and some causative.

PATHOLOGY.

Fricke and Brown[40] report the results of a study of 76

cases of hypertrophied lymphoid tissue in the nasopharynx in which gamma rays of radium were used for treatment at the Mayo Clinic during the three years from 1939 through 1941. Almost half of the cases (36) were males; ages ranged from two to 48 with an average of 18.8 years. Permanent improvement was obtained in 45 (59 per cent) of the 76 cases, temporary improvement in 13, or 17 per cent, and no relief in 18 (24 per cent). From this study it was concluded that better results were obtained in the younger than the older patients; no injurious effect followed treatment; adenoidectomy supplementing irradiation did not give better results than radiation alone; and finally, larger doses produced better results than smaller doses.

Rentschler and Settle[41] admit that radium emanation is preferable in the treatment of hyperplastic lymphoid tissue in the nasopharynx; they call attention to the fact that if radium is not readily available, Roentgen irradiation is a more feasible form of treatment. They describe the technique of Roentgen irradiation and report five cases of obvious impairment of hearing from middle ear diseases associated with nasopharyngeal lymphoid hyperplasia, selected from a group of 35 patients who had received Roentgen treatment of the nasopharyngeal region to reduce excessive lymphoid tissue. In 19 of these the treatment was for impairment of hearing and middle ear disease; three of this group were adults with long-standing middle ear disease and did not improve. The remaining 16 were between the ages of seven and 19 years; in eight hearing was restored to normal and in seven it was improved but did not return to normal.

Ashbury[42] presents an analysis of 157 cases of lymphoid tissue in the nasopharynx and pharynx seen during the five-year interval between 1939 and 1943 and treated with Roentgen rays and/or gamma rays. Of these, 86 (55 per cent) were males; the greatest incidence occurred in the first decade with an even spread in middle age and a rapid decline above the fifth decade. Basically, the treatment consisted of three pairs of Roentgen ray treatments, a radium treatment and two more pairs of Roentgen ray treatments within a period of 29 days; two treatments were given in the first

week and the remaining ones at weekly intervals. Ashbury noted gratifying results in the treatment of children with conduction deafness as well as those who suffered principally from respiratory obstruction and infection. He also states that in sinus disease due to obstruction of the ostia by lymphoid tissue, good results can be expected. It is generally agreed that lymphoid tissue becomes less radiosensitive with age and also in the presence of prolonged suppurative infection, in which cases larger doses will be required. Ashbury says that this is the reason that a careful examination including nasopharyngoscopy should be done in order to determine cases suitable for treatment. The full effect of irradiation is not ordinarily noted until from six to eight weeks after the final treatment.

Another report on the Roentgen treatment of lymphoid tissue in the nasopharynx is presented by Hawley.[43] Recurrence was noted in only two of 26 cases in which a dose of 700 to 800 tissue r was used; in the others the lymphoid tissue disappeared. No unfavorable reactions were noted. The patients were followed for two years. In eight, hearing was normal but the lymphoid tissue caused nasal obstruction or retraction of the eardrums, or both. In the two cases in which there was recurrence, a second course of treatment gave permanent relief. In 18 cases in which there was some impairment of hearing and excessive lymphoid tissue, the excessive lymphoid tissue disappeared and hearing was improved in all but one; however, in only two cases did hearing return to normal. Hawley explains failure of normal hearing to be restored because suppuration produces irreversible cicatricial changes.

From December, 1942, to March, 1944, 220 soldiers with otitis associated with excess lymphoid tissue were treated by radon implantation.[44] Of 29 airmen with recurrent otitis media who received 200 mg. hr., 28 (98 per cent) were relieved of otitis media. Of 47 cases of otitis media in the ground force treated with 200 mg. hr. or more and followed for at least four months, 35 (75 per cent) were free from the disease. The hearing was improved and deafness did not recur in four months in 40 out of 54 men (74 per cent). In a group of 12 men with complications, hearing improved for

low tones in three cases (25 per cent). Three airmen out of seven with tinnitus were improved following treatment. Fowler calls attention to the fact that experience with ground personnel and children has shown that hyperplasia of lymphoid tissue in the nasopharynx predisposes to otitis media and it can be controlled with radiation. He states that experience in the treatment of recalcitrant disease of the upper respiratory tract and secondary otitis media makes one certain clinically that radiation is the treatment of choice if adenoid tissue on the lateral nasopharyngeal walls blocks the Eustachian tubes. He believes, however, that despite the fact that no accidents have resulted from relatively safe dosage, it is imprudent for the otolaryngologist to attempt radiotherapy of the nasopharynx without the continual guidance of a qualified radiologist. Under the supervision of a trained specialist in radiotherapy, he points out that "treatment of the lymphoid tissue about the Eustachian tube with radon or radium is simple, easily learned and relatively inexpensive. It is infinitely more efficacious and the effects more permanent than those of catheterization, politzeration or bouginage."

REFLEX.

Graham and Lewis[45] made a study of the action of the pharyngeal and corneal reflexes in 375 persons. The group was classified as follows: 163 normal, 15 with dermatoses of known psychotic origin, 24 with dermatoses associated with a psychogenic factor and 173 with various dermatologic diseases in which there was no psychogenic factor. Of the 173 persons with miscellaneous nonpsychogenic dermatoses, the pharyngeal reflex was absent in 26.6 per cent and the corneal in 41.6 per cent. In the 163 normal persons, the pharyngeal reflex was absent in 32.5 per cent and the corneal in 40 per cent. This study suggested to the authors that absence of the pharyngeal and corneal reflexes "is of limited significance in establishing a diagnosis of psychotic dermatosis, since these reflexes are frequently absent in normal persons and in patients with dermatoses not of psychotic origin. Since our review of the literature and the findings in our own cases of dermatitis factitia show a high percentage of absent reflexes,

we believe that a presence of these reflexes is evidence against this diagnosis."

SURGERY.

Imperatori[46] reports a case of atresia of the pharynx in a three-and-one-half-year-old boy who experienced difficulty in breathing and swallowing within a few days after tonsillectomy and adenoidectomy. Examination showed a web of scar tissue stretching from the hard palate, including the soft palate and the uvula in a downward direction to the posterior wall of the lower part of the oropharynx approximately at the level of the dorsum of the tongue when depressed. At the lower part near the junction with the pharyngeal wall there was a small fistula. A diagnosis of pharyngeal obstruction produced by a web of scar tissue closing off the oropharynx and nasopharynx was made. Operation by the Mackenty method was performed. The opening had to be dilated at weekly and later monthly examinations with a Kelly clamp. The opening at the time of the report was approximately two-thirds that at the time of the completion of the operation. The voice was good and the breathing and expiratory blast from the nostrils appeared to be normal.

TUBERCULOSIS.

Szanto and Hollender[47] believe that the frequent incidence of tuberculosis of the nasopharynx and its relationship to pulmonary tuberculosis warrant its more careful consideration. In 134 consecutive autopsies in which a general pathologic study of the nasopharynx was done, these authors found 24 with various forms of pulmonary tuberculosis and of these, 18 (75 per cent) showed tuberculous involvement of the nasopharynx. The common sites of tuberculous lesions of the nasopharynx were found to be the posterior part of the roof and the upper part of the posterior wall; they were less frequently noted at the posterior margin of the ostia of the Eustachian tubes and the nasopharyngeal surface of the uvula and the soft palate. Gross tuberculous lesions were found in 14 of the 18 specimens. The authors believe that their studies "emphatically demonstrated the value of clinical

investigation of the nasopharynx in all routine physical examinations, especially in persons with pulmonary tuberculosis."

TUMORS.

Eggston[48] considers the nose and throat a fertile field for the study of neoplastic diseases because practically every variety of tumor may at times occur in this region. He believes that chemical irritant substances offer at present the most plausible explanation of the growth of tumors. The entire article is devoted to a brief discussion of the various types of tumors encountered in the nose and nasopharynx including fibromas, osteomas, chondromas, chordomas, myxomas, angiomas, endotheliomas, tumors of lymphoid structure, lymphomas, plasmocytomas, lymphosarcomas, transitional-celled tumors or lymphoepitheliomas, tumors originating in the bone marrow, nerve tissue tumors, cylindrical-cell papillomas, tonsillar papillomas, adenomas, squamous-cell carcinomas, papillary carcinomas, mixed or salivary gland type of tumors and teratomatous fibromas. From past experience Eggston has formulated a distinct opinion that radical surgical procedures have too frequently been replaced by radiation. He believes that radical removal of nasopharyngeal growths in difficult locations should always be undertaken regardless of cosmetic results. He gives the following "erudite decision" as to when operation or radiation should be employed: "Surgery should be supplemented by the most intelligent use of radiation subject to individualization in each case."

Rao[49] reports the results of a study of 40 cases of nasopharyngeal tumors seen in the last 15 years at the King George Hospital, Vizagapatam. Eighteen were benign (fibromas) and 22 malignant growths. The malignant tumors were classified as lymphoepithelioma (three cases); rhabdomyoma (one case); adenolymphoma (one case); endothelioma (one case); sarcoma (three cases); and 13 were undetermined. In the benign group there was one nasal fibroma treated by radium. The 17 nasopharyngeal fibromas were treated as follows: three surgically with two deaths and one cure; five

by a combination of operation and radium with two cures. two relieved of symptoms and one death; five by radium alone with one cure, two relieved of symptoms and two deaths; and four did not accept treatment.

Hill[50] reports an interesting case of neurofibroma of the pharynx with postoperative laryngeal paralysis in a 20-year-old woman. Examination revealed pronounced bulging of the left lateral wall of the pharynx extending from the level of the base of the tongue, upward behind the soft palate almost to the torus tubae. By blunt dissection a large encapsulated tumor, extending nearly to the base of the skull, measuring 6 cm. x 4 cm. and yellowish-white in color, was removed. The histopathologic diagnosis was neurofibroma. Drooping of the left eyelid and a contracted pupil were noted on the second postoperative day but these subsided within two days; however, a left abductor laryngeal paralysis appeared and up to the time of the report had persisted — a period of eight months. Hill believes that this complication suggests the vagus nerve origin of the growth, probably adjacent to the jugular foramen. At first the vocal cord was in adduction and later changed to the cadaveric position; this suggests progressive involvement, first of the more susceptible abductor fibres, followed later by the adductors.

Cook[51] presents a general discussion on the occurrence, etiology, signs and symptoms, prognosis and treatment of fibromas of the nasopharynx. He emphasizes the fact that although these tumors are histologically benign and do not metastasize, they are as fatal as the most malignant lesion. He considers palliative and expectant treatment sometimes advisable because it has been observed that these tumors sometimes tend to grow slower or even cease growing and retrograde changes take place with cessation of bodily growth. Roentgen ray therapy has been noted to hasten recession.

Foster[52] reports the case of a congenital nasopharyngeal dermoid tumor in a 19-day-old infant in whom, on examination, a rounded tumor could be seen attached to the posterior pharyngeal wall. The growth, which was freely movable on a small pedicle, was grasped with a forceps and removed with a snare. It was bean-shaped and measured 1.5 cm. x 1.2 cm. x

1 cm. Fat formed the greater portion of the interior of the mass and in the very center there was a slender bar of cartilage.

WOUNDS AND INJURIES.

Another unique case is reported by Hankins,[53] who was unable to find a similar case in the literature. It was the case of a 26-year-old sergeant admitted for pyschiatric study, in whom it was incidentally noted that there was a bulge the size of an egg in the right cervical region just below the angle of the mandible, appearing when the patient closed his mouth and blew. The patient reported that he felt something "give way" in the right side of his neck about six months prior to admission while blowing his trumpet. Radiographic and fluoroscopic examinations, while the patient was blowing against pressure, showed the hypopharynx filled with air and a bulge of the cervical muscles laterally. The pyriform sinuses were filled with air and the weakened muscular walls bulged laterally on both sides above the level of the larynx. The right side was seen to be more prominently dilated. Barium outlined the lateral walls of the pharynx. The posterior wall of the trachea, just below the larynx, bulged posteriorly on the esophagus. The apices of the lungs rose above the clavicles and in the lateral view could be seen superimposed on the lower portion of the trachea.

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M. PTERYGOPHARYNGEUS AND ITS RELATION TO M. PALATOPHARYNGEUS.

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INTRODUCTION.

Dorrance,[1,2] Wardill[12,13,14,15] and others[3,5,10,16] have concerned themselves with the exact anterior attachments of the pterygoid division of the superior constrictor muscle. The majority of these writers agree that, in addition to its attachment at the medial lamina of the pterygoid plate and its hamulus, the pterygopharyngeus muscle of the superior constrictor also has an attachment in the aponeurosis (or at the reflected tendon of the tensor palati) in the soft palate. Le Double[5] and Testut[10] maintained, however, that the presence of a palatine origin of the superior constrictor was an exceptional condition. With the exception of these two writers, no other investigator, to the present writer's knowledge, has reported whether these palatal fibres were typical or atypical findings. This study was undertaken to supply that information.

It will be recognized that a palatal origin of the superior constrictor muscle must necessarily be mesial to its hamular origin. Thus, if a palatal origin does exist, the action of this part of the muscle would be to exert greater inward pull on the side walls of the pharynx than would be the case if only the hamular origin existed. The assurance that a palatal origin of the superior constrictor muscle commonly exists would provide a sound anatomical basis for the point of view that extensive mesial movement of the lateral walls of the pharynx occurs during velopharyngeal closure.

MATERIALS AND METHODS.

The head and neck regions of 10 cadavers were obtained

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through the Department of Anatomy of the State University of Iowa Medical School.

The heavy muscles and fascia at the base of the skull were severed. The head was disarticulated from the spinal column. The remaining structures in the neck were then severed from the body at the level of the inferior border of the cricoid cartilage of the larynx.

The pharyngeal tube, which could now be seen, was split along the posterior median line from the larynx up to its attachment at the base of the skull. By spreading the split edges of the pharynx outward, a view could be had of the naso-, oro- and laryngopharynges.

The mucous membrane lining the inner surface of the pharynx, and the pharyngeal aponeurosis were removed, exposing the muscle fibres. The superior constrictor muscle was traced from its cut edge forward toward its origin on either the right or left side, depending upon which side was used. As the dissection continued forward, the pterygopharyngeus muscle was separated from the palatopharyngeus. The dissection was carried forward until progress was interrupted by the crossing of the levator palati and also of the salpingopharyngeus muscle when present; then, to permit closer dissection of the superior constrictor muscle, the levator and salpingopharyngeus muscles were cut. The superior constrictor could then be traced forward to its origins. Part of the detailed work was done with the aid of a dissecting miscroscope.

RESULTS.

Results are presented by detailed descriptions of observations made on each specimen. Descriptions are substantiated by sketches and by completely unretouched photographs, some of which are reproduced here.

Specimen 1: The right side of the pharynx was dissected. The pterygopharyngeus muscle was traced forward. As it passed anterior to the palatopharyngeus muscle, there was an extensive interchange of fibres between the two muscles. It was difficult to separate these muscles because of the inter-

connections. In addition to the scattered smaller fibres, there was one large branch running from well forward on the inferior surface of the palatopharyngeus, back to interdigitate with the fibres of the superior constrictor muscle.

Further dissection of the pterygopharyngeus muscle showed that the main body came from the hamular process. The tendon appeared to be wrapped around the hamulus, and the muscle came from the medial aspect of the hamulus to be continued laterally and posteriorly toward its insertion.

Specimen 2: Muscular development of this specimen was very heavy in those parts observed. The right side of the pharynx was used. There was a heavy distribution of muscle fibres running between the palatopharyngeus muscle and the superior constrictor muscle. It was so heavy as to resemble a lattice-work. It was difficult to separate these muscles in this specimen.

The few upper fibres of the pterygopharyngeus muscle were distinct from the main body of fibres originating at the hamulus. These upper fibres formed a band which by-passed the hamulus and which had their origins in the palatal aponeurosis at the juncture of the insertion of the palatopharyngeus muscle. A wider inferior band of fibres of the superior constrictor muscle had its origin at the pterygoid hamulus.

Specimen 3: Both sides of this specimen were used. The entire mandible was removed. An interchange of fibres between the superior constrictor muscle and the palatopharyngeus muscle was visible.

The pterygopharyngeus muscle appeared to be divided into two sheaths. The internal sheath and the lower part of the external one originated at the hamulus. The internal sheath, however, joined the middle constrictor. The few top fibres of the external sheath originated in the palatal aponeurosis just inferior to the attachment of the levator. These also joined the middle constrictor. This was atypical. The internal sheath commonly had its origin in the soft palate.

Specimen 4: The right side was used for dissection. The

palatopharyngeus ran forward to interdigitate with the levator palati. Superior constrictor fibres were sparse. A small lower bundle ran from the hamulus. Another distinct upper sheath of fibres came from the palatopharyngeus high up on the palate. This was mesial to the lower bundle. The precise attachment could not be determined because of the scarcity of fibres. Muscular development was very thin.

Specimen 5: The right side was used. The salpingopharyngeus muscle was absent. As the superior constrictor muscle was traced forward, fibres were seen to run between it and the palatopharyngeus, mesially. The main body of the pterygopharyngeus originates at the hamulus. However, several fibres at the top of the superior constrictor were traced mesial to the hamulus and attached high on the soft palate.

Two sheaths, similar to those described in Specimen 3, were seen in this specimen. The internal sheath came from low down on the hamulus. A small band of fibres ran between this band and the palatopharyngeus muscle. The external sheath ran from the hamulus, but farther up. The top several fibres ran mesial to the hamulus from the soft palate. The palatopharyngeus also sent a few fibres to this sheath.

Specimen 6: The right side was dissected. The salpingopharyngeus, which was small in relation to the other muscles, attached in part on the upper surface of the soft palate.

As the superior constrictor muscle ran lateral to the palatopharyngeus muscle, there was an interchange of fibres between the two. The main body of the pterygopharyngeus came from the hamulus, but a very narrow strand at the top of the bundle had its origin in the soft palate.

Specimen 7: The left side was used. As the superior constrictor passed lateral to the palatopharyngeus, a heavy exchange of fibres occurred between the two muscles. Fibres of the superior constrictor muscle were very high up. The Eustachian orifice had to be cut to expose them.

A thick, wide bundle of fibres of the superior constrictor came from the hamulus. Except for the distribution of fibres between the superior constrictor and the palatopharyngeus,

no fibres of the superior constrictor came from the soft palate.

Specimen 8: The left side was dissected. The salpingopharyngeus was well developed. It had an attachment with the levator palati at the latter's insertion in the soft palate.

The superior constrictor came from the hamulus in two distinct bundles. One, in an internal sheath, came from the upper part of the hamulus. The second, just external to it, originated at the hamulus. The two bundles became continuous at a point in the side wall of the pharynx. The upper sixth of the external bundle came from the soft palate just inferior to the insertion of the levator palati. The tendon of the tensor ran through the palatal origin of the superior constrictor muscle.

Specimen 9: The right half was dissected. This specimen was atypical in that there were no muscles whatever in the posterior half of the soft palate. Although the shape of the uvula was present, the uvula contained no muscle. Also, the levator, instead of spreading out along the upper surface of the palate, crossed straight over in a compact bundle to join its fellow on the opposite side.

The main bulk of the palatopharyngeus muscle passed up and beneath the levator to turn mesially and join with its fellow.

The palatopharyngeus and superior constrictor muscles are joined by a large bundle. A small, lower bundle of the superior constrictor came from the hamulus. A large bundle at the top of this muscle originated in the soft palate from the tendon of the tensor just mesial to the lateral pterygoid plate.

Specimen 10: The right half was used. The salpingopharyngeus muscle was absent.

The palatopharyngeus muscle came from far forward and appeared to attach with the levator palati, both of which were near the surface of the palate.

As the superior constrictor passed anterior to the palatopharyngeus, the two exchanged fibres so thickly they could

hardly be separated. The lower part of the superior constrictor originated at the hamulus. However, a narrow strand at the extreme upper border of the superior constrictor ran mesially and originated with the palatopharyngeus about where the levator inserted into the palate.

ANATOMIC FINDINGS.

Muscular relationships in this region are subject to wide variations. Results of the dissections carried out in this

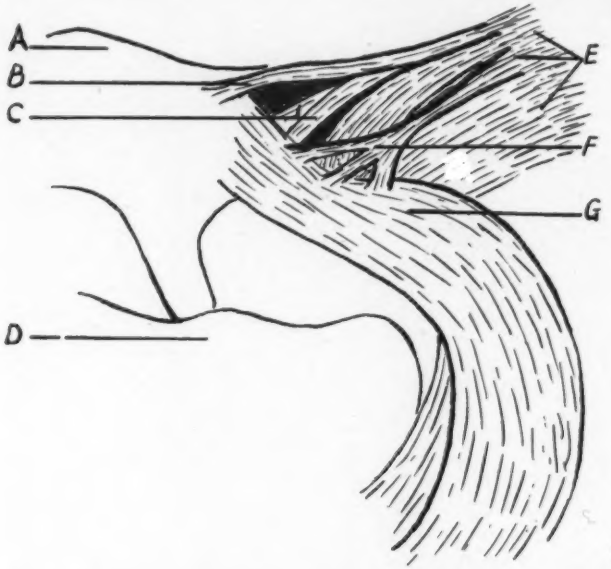

Fig. 1. Schematic drawing of a posterior view of the right side of the nasopharynx to show the muscular relationships between the superior constrictor and soft palate and between the superior constrictor and palatopharyngeus muscles. This drawing pictures the structures seen in Fig. 2. (A) Soft palate. (B) M. pterygopharyngeus, palatal division. (C) M. pterygopharyngeus, hamular division. (D) Root of the tongue. (E) M. superior constrictor. (F) Muscle fibres connecting M. pterygopharyngeus and M. palatopharyngeus. (G) M. palatopharyngeus.

study indicate that variation occurs both in total muscular development and in the dispersion of specific muscle fibres.

In every case the superior constrictor muscle had an origin at the pterygoid hamulus. In eight of the 10 dissections a

palatal origin of the superior constrictor was also found. This origin consisted in seven cases of a thin band of muscle fibres found at the top of the superior constrictor, which ran from the palate just inferior to the point where the levator palati inserted into the palate. In one case the palatal division comprised the larger part of the superior constrictor muscle (see B, Figs. 1 and 2).

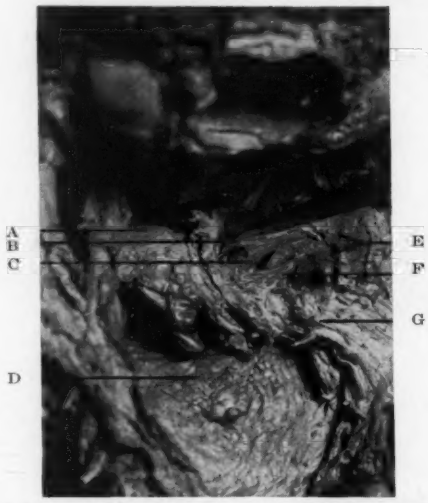

Fig. 2. Posterior view of the right half of the nasopharynx to show the hamular and palatal divisions of the pterygopharyngeus muscle, as well as muscular connections between the palatopharyngeus and pterygopharyngeus muscles. (A) Soft palate. (B) M. pterygopharyngeus palatal division. (C) M. pterygopharyngeus, hamular division. (D) Root of the tongue. (E) M. superior constrictor. (F) Muscle fibres connecting M. pterygopharyngeus and M. palatopharyngeus. (G) M. palatopharyngeus.

In three cases the palatal division of the pterygopharyngeus muscle consisted of an entirely distinct sheath which was somewhat external to the hamular division on the lateral walls, but which passed mesial to the hamulus. In two cases the internal sheath was invested by the middle constrictor. The external sheath appeared to join the middle constrictor on its outer surface.

It seems significant that in eight of 10 cases a palatal origin of the superior constrictor was found to exist. Thus,

these results would seem to indicate that the palatal origin of the superior constrictor is the typical rather than exceptional condition.

Of further interest was the consistent interconnection between the palatopharyngeus and the pterygopharyngeus muscles. This occurred by means of many individual muscle fibres rather than through a large separate strand (see F, Figs. 1 and 2). In most cases the connection between muscles was so close that it was almost impossible to separate the two. Townshend,[11] in 1940, observed these fibres. According to him, "The fibres of the superior constrictor and the palatopharyngeus are often so hopelessly entangled in the human subject that it is impossible to say where one muscle begins and the other ends." McMyn,[6] in describing these connecting fibres, maintains that they arise from the soft palate with the palatopharyngeus muscle. The present writer recognizes that these fibres may ultimately originate in the velum, but he is unable to say definitely that the palate comprises the anterior attachment for these fibres.

THEORETIC IMPLICATIONS.

The presence of a palatal origin of the superior constrictor muscle in eight of the 10 cadavers suggests a sound anatomical basis for the point of view that mesial movement of the lateral pharyngeal walls regularly occurs during velopharyngeal closure.

In addition to this now well-established fact, mention should be made of the implications which are suggested by the presence of interconnecting fibres between the palatopharyngeus and ptergopharyngeus muscles.

The most easily observable action of the palatopharyngeus muscle is that of approximating the posterior arches of the fauces, which action occurs during deglutition and, to a lesser degree, during speech.[7] This action *alone* is not especially pertinent to our understanding of the mechanism of velopharyngeal closure; however, the interconnecting fibres between these previously-named muscles give the approximating movement of the posterior pillars considerable importance. We have in this movement an indication that the

lateral pharyngeal walls may actually be *drawn* inward when the pillars are approximated. Perhaps this action is what Passavant referred to in his statement, "We have, therefore, two methods of closure of the palate: one is used during speech and is produced by the action of the superior constrictor muscles and the levator muscles of the palate. The second method of closure occurs during swallowing and is produced in the same way as in speech but strengthened by the additional contraction of the palatopharyngeus muscles."[9]

Although Passavant apparently would not agree, it seems logical to the present writer that the contraction of the palatopharyngeus muscles, which admittedly occurs during speech, would also result in some degree of inward pull upon the lateral pharyngeal walls during the speech process. It is clear, however, that further investigation is needed in order to state that such is really the case.

SUMMARY AND CONCLUSIONS.

Detailed dissections of the soft palates and pharynges of 10 cadavers were undertaken. The purpose was to attempt to investigate the palatal origin of the pterygopharyngeus muscle. The palatopharyngeus muscle was also studied.

In eight of 10 cases a palatal origin of the pterygopharyngeus muscle was found to exist. In the majority of cases this bundle consisted of a small strand of fibres which originated near the insertion of the levator palati in the palatal aponeurosis. In all cases a hamular origin to this muscle was found. The hamular origin was the better developed and was just inferior to the smaller palatal origin.

In eight of 10 cases there were muscle connections between the palatopharyngeus and the pterygopharyngeus muscles.

It was observed that there is considerable variability in general muscular development in this region of the body.

Results of this study suggest the following conclusions:

1. In addition to their hamular divisions, the pterygopharyngei were found to receive fibres which originate in the soft palate.

2. These palatal fibres may contribute to mesial movement of the pharyngeal walls during velopharyngeal closure.

3. Muscular connections between the palatopharyngeus and the pterygopharyngeus muscles normally exist.

4. Because of these connections, the approximation of the palatopharyngei during velopharyngeal closure may contribute to the mesial movement of the lateral pharyngeal walls.

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MYRINGITIS GRANULOSA.*

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The purpose of this thesis is to discuss an aural affection called "myringitis granulosa." In spite of thorough search in the American medical periodicals, not a single dissertation about this disease could be found. Recent textbooks of otolaryngology are also void of any description of it. Only in a very few of the older textbooks such as "Politzer's textbook, Diseases of the Ear, an American textbook of Diseases of the Eye, Ear, Nose and Throat by G. E. DeSchweinits, and a manual of Diseases of the Nose, Throat and Ear by E. B. Gleason" is this condition described.

The author had the opportunity to observe in a comparatively short time, a number of cases of myringitis granulosa; the greater part of the material for these observations was found among army inductees during physical examination. A differential diagnosis between a chronic otitis media and myringitis granulosa is sometimes difficult, because their symptoms are very similar in many respects; in two instances the inductee was rejected because a diagnosis of chronic otitis media was made, while actually a myringitis granulosa was the aural affection. The relative rarity of the disease, the apparent failure of recognition and its obscurity in medical literature seem to justify a description in detail.

HISTORY.

Myringitis granulosa is mostly found among younger patients and more frequently during the summer months, the season of much swimming and outdoor sport. The history given by the patients in regard to the ear ailment is very indefinite. Some of them are entirely unaware of the condition, some state they had intermittent running ear, or a slight

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discomfort from the feeling of fullness and itching in the ear canal; there is rarely any pain connected with it; none complained of impairment of hearing; seldom is a physician consulted for it.

DIAGNOSIS.

In practically all cases the ear canal was filled with debris, desquamated material and a foul-smelling purulent secretion; sometimes the ear canal itself was clean, and only the drum covered with dry, dirty, greenish crusts. Only meticulous and thorough cleansing, which often requires a great deal of patience, will free the drum from the adherent material and permit a minute inspection. The following findings present themselves: A large portion of the drum may have a normal appearance, except for a slight thickening; the malleus is plainly visible, other parts of the drum are reddened and covered with raspberry-like granulations of light red color. These excrescences are the main characteristics of the disease. They may occur either singly, in groups or, in rare cases, may cover the entire drum. They differ in size, but are seldom larger than a pinhead or hempseed. In most cases the lesion is confined to the posterior-superior quadrant, where a plaque of granulation covers a considerable area. Less frequently one finds the granulation in the anterior-inferior quadrant. The Shrapnell membrane may be the site of the lesion, even the short process might be covered with a small granulation plaque. Very rarely do these excrescences trespass the sulcus tympanicus and extend to the skin of the external canal. The handle of the malleus is very seldom covered with these granulations, except in those rare cases where the entire drum is involved. In the presence of multiple lesions, small blood vessels interconnect these granulations, giving the impression of a panus-like formation.

DIFFERENTIAL DIAGNOSIS.

These granulations in myringitis granulosa can easily be mistaken for granulations as found in chronic otitis media, especially when they protrude through a marginal perforation of the drum; even the experienced otologist might encounter difficulties in making a correct diagnosis. To eval-

uate properly an existing aural affection, it is always essential to get the ear canal and drum free of all obstructing material in order to get a clear picture of the tympanic membrane; in some cases this cannot be accomplished at the first examination, and several attempts are necessary.

The following findings will be an important aid in differentiating a myringitis granulosa from a chronic otitis media:

1. In myringitis granulosa, no perforation of the drum will be found. In order to be positive about this, the use of the Siegle speculum is essential. In myringitis granulosa there is free movement of the drum in contrast to marked limitation, or even fixation in the presence of a drum perforation and middle ear involvement.

2. In touching these granulations with an applicator, one does not encounter free bleeding as is frequently noticed in granulations originating from the tympanic cavity.

3. While in chronic otitis media the hearing is always impaired, such is not the case in myringitis granulosa, providing all secretions and debris are removed from the ear canal and drum.

4. Once the ear canal is free of secretion, reformation of it does not follow as quickly as in otitis media in which examination with Siegle speculum will always produce some discharge from the middle ear.

5. Absence of any localized or referred pains in the head and of any generalized malaise, such as vertigo, discomfort or fever.

PATHOLOGY.

The tympanic membrane is composed of three layers, an external cuticular (stratum cutaneum), a middle fibrous (lamina propia) and an internal mucous membrane layer (stratum mucosum). The cuticular layer is easily detached from the fibrous one, but the internal mucous membrane layer is so closely connected with the membrane propria that it is impossible to separate them. The cuticular layer is a continuation of the cutis of the external canal and consists of stratified squamus epithelium; however, the cuticular layer

of the drum differs considerably from the cutis everywhere else. The corium is reduced to a very thin layer of connective tissue and does not have any papillae. The epidermal part is also extremely thin, although somewhat thicker at the umbo and to the lesser degree at the rim, consisting of a few layers of squamous cells. The stratum corneum of the drum does not desquamate in the usual way, but grows from the center of the drum to the periphery (comparable to the growth of a finger nail), where it is finally detached and becomes part of the general debris. Thus the drum surface always maintains its smooth glistening appearance. Any inflammatory process may attack any of the three layers of the drum. In otitis media the stratum mucosum is involved first, affecting gradually all layers by continuity; through the hematogenous route the lamina propia may primarily be affected, as, for instance, in tuberculosis of the ear; the stratum cutaneum can be involved by an inflammatory process of the external ear canal.

In acute myringitis the cuticular layer also is the seat of the inflammation. An exudate is effused below the rete malpighis as a clear or purulent fluid or as a hemorrhagic exudate, which raises the epidermic layer in the form of bullae; but these changes in the cuticular layer are capable of complete resorption, if the process stays confined to that layer. Very rarely a thickening or cloudiness of the drum follows an acute myringitis.

On the other hand, in cases where an irritating agent causes a chronic inflammation of the cuticular layer of the drum, more drastic changes take place. A destruction of epithelium results from it, leaving a raw surface. The ever-present irritating agent prevents an immediate formation of new epithelium, to cover this defect; thus the bare connective layer forms for its protection granulation tissue. If this process continues for any length of time it will cause excessive proliferation of this granulation tissue, thus forming the characteristic raspberry-like excrescences. Whether this ulcerative process after eventually healing will leave a thin or thick scar in the drum depends on its penetration into the drum layers.

The calcareous deposits so often found in eardrums may be the result of regressive changes of scar tissue in the substance of the drum; in some instances, myringitis granulosa may be responsible for these changes; but this assumption is pure speculation, because none of the cases have been observed over a period in which such changes could take place. The fact remains that myringitis granulosa and these calcareous deposits are found in identical locations; further investigation may clarify these findings.

ETIOLOGY.

Smears were taken in all reported cases; culture in Case 6 and a biopsy in Case 7. In the smears no specific organisms were found, only a mixture of Gram negative bacilli and cocci; the culture showed Gram negative staphylococcus aureus; the Gram stain of the biopsy section in Case 7 revealed Gram positive cocci and diphtheroids along the surface and clumps of monilia within the granulation. In all cases except Case 4 there were but few pus cells. This would indicate the absence of any severe inflammatory reaction of the involved tissue.

It must be assumed that organisms which are responsible for an inflammatory process of the external ear canal are also the pathogenic factor in myringitis granulosa; undoubtedly the inflammation of the external ear canal precedes the one of the tympanic membrane. Frequently the inflammation of the ear canal had mostly subsided at the time of observation; on the other hand, it is possible that the irritating factor did not affect the thicker, more resistant skin of the external canal, but did involve the more delicate, thin cuticular layer of the drum. Fungi undoubtedly played an important part as an etiological factor, although they were found in only one case. They may not be present in the secretion of the ear canal, especially in cases of long standing, but still grow in the more favorable medium of granulation tissue.

TREATMENT.

Most important is repeated, thorough cleansing of the external ear canal; removal of all secretion and debris; installation of 70 per cent alcohol and 1 per cent salicylic acid will

take care of an ordinary external otitis. In the eczematous type, instillations of 10 per cent ichthyol glycerine will give better results. The granulomata of the tympanic membrane respond well to cauterization with a 10 to 20 per cent silver nitrate solution; usually after several treatments they disappear and the drum regains its smooth although thickened appearance.

CASE REPORTS.

Case 1: Ph. St., male, age 23. The right ear was often itchy; there also was an intermittent scanty discharge, but it did not annoy him enough to consult a physician; he did not notice any hearing impairment or any pain. The right ear canal was filled with purulent secretion and desquamated material. After thorough cleansing, the drum was visualized; the posterior-superior quadrant was covered with raspberry-like granulations, the remaining part of the drum being intact but thickened, freely mobile on examination with the Siegle speculum, no perforation. The smear showed many Gram negative bacilli a few Gram positive cocci, occasional pus cells.

Case 2: E. M. McL., male, age 34. A discharging right ear off and on for many years; sometimes the odor from the discharge was offensive, no hearing impairment, no pain, no treatment. A small bony exostosis of the ear canal caused some narrowing; the posterior-inferior quadrant of the drum covered with numerous raspberry-like excrescences; otherwise an intact but thickened drum. Examination of smear: Gram negative cocci and bacilli, some with metachromatic granules, Gram positive cocci (probably staph), many squamous cells, no pus cells.

Case 3: V. R., male, age 20. A similar history as in previous cases; the whole posterior half of the left drum covered with granulation-like excrescences. Smear: many Gram negative bacilli and cocci, some diplococci, many squamous cells, occasional pus cells.

Case 4: L. J. L., male, age 18. Two months prior to examination a slight ache in left ear; no cold preceded; was seen by a physician who diagnosed it as an acute otitis media and prescribed a sulfa drug. After several days the ear started to discharge and has done so ever since. The left ear canal was filled with debris and a foul-smelling secretion. Numerous granulations covered the superior-posterior region of the drum. Near the center a tit-like projection was noticeable. No fixation of the drum, normal hearing. Smear: many Gram negative pleomorphic bacilli (bacillus influenza), a few Gram negative cocci, many pus cells. This case might not entirely fit in the group of genuine myringitis granulosa, as a middle ear infection could not be ruled out. The nipple-like elevation of the drum might have been the place of perforation; furthermore, the smear showed many pus cells in contrast to the few seen in other cases, an indication of a more severe inflammatory process, either in the ear canal or middle ear.

Case 5: W. R., male, age 33. Seen in private practice, intermittent discharge from right ear for five years, itching sensation, no pain, no impairment of hearing, origin unknown. Three months prior, he was examined for induction into the army and was rejected because of this condition; the diagnosis was "chronic otitis media in the right ear." The ear canal was filled with a purulent secretion, desquamated material, and severely inflamed; the drum markedly thickened; the posterior half covered

with granulation tissue; no detectable perforation, no fixation of the drum; audiogram showed normal hearing. Smear: a mixture of Gram negative cocci and bacilli. Repeated thorough cleansing and cauterization of the granulations with 20 per cent silver nitrate brought quick improvement; the itching and discharge ceased and the drum had again a smooth but thickened appearance.

Case 6: B. B. M., female, age 20. Seen in private practice; for several months intermittent discharge from the left ear, and a feeling of fullness; slightly impaired hearing; no pain; has been swimming a great deal the preceding month; no previous ear trouble. Left ear canal filled with a foul-smelling purulent secretion; the inferior-posterior quadrant covered with granulation tissue; otherwise normal drum; only a very slight impairment of hearing in left ear. Culture taken showed a pure growth of staphylococcus aureus. Again thorough cleansing and cauterization of granulations brought very quick recovery.

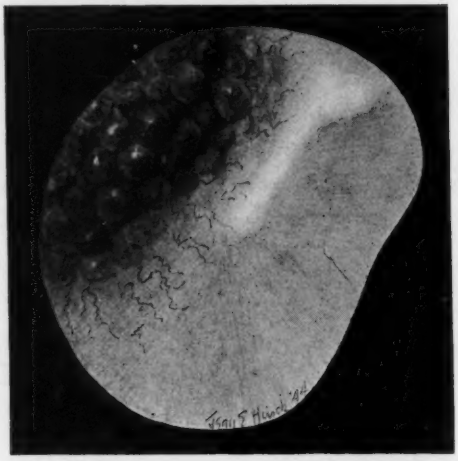

Fig. 1. The picture of an eardrum in a typical case of myringitis granulosa.

Case 7: J. P. W., male, 17 years: (See Fig. 1) For about one year intermittent discharge from both ears; no pain; no loss of hearing; never received any treatments. Both ear canals filled with a foul-smelling secretion and desquamated material; right drum thickened and the posterior-middle portion covered with granulation tissue; similar condition in left ear, except the granulations were not so numerous. Smears: many flat epithelial cells, diphtheroid bacilli, staphylococci, pleomorphic Gram negative bacilli. Biopsy examination by Dr. K. Ikeda (see Figs. 2 and 3). There is a minute piece of granulation tissue covered partly by horny epithelium and showing proliferation of fibroblasts and new capillaries and diffuse infiltration of many plasma cells and some leucocytes and lymphocytes. Diagnosis: "Chronic inflammatory granulation tissue"; Gram stain of the section shows Gram positive cocci and diphtheroid bacilli along the surface, and clumps of monilia within granulation."

COMMENT.

A considerable number of cases of myringitis granulosa were observed during a rather short period; therefore, one must conclude that it is not such a rare disease as one would expect from the scarcity or practical absence of reports about it in the medical literature; thus it must be unknown to many physicians. Myringitis granulosa is not a serious disease and its symptoms are not very annoying to the patient; intermittent aural discharge, occasional itching and a feeling of fullness in the ear being the cardinal symptoms. In chronic

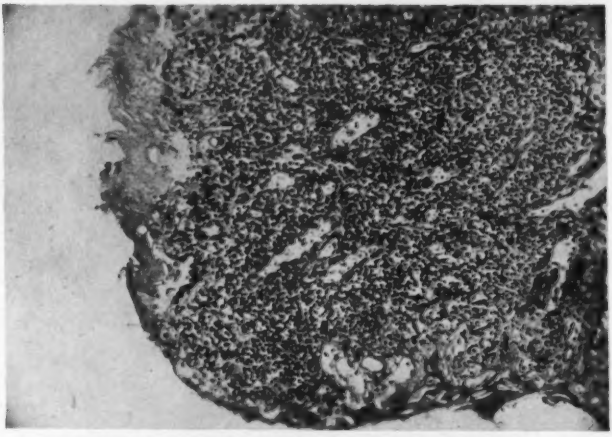

Fig. 2. Histological section of a granulomata.

purulent otitis media we are confronted with similar symptoms; therefore, a wrong diagnosis can easily be made (see Cases 5 and 7) if one is not cognizant of the existence of an aural affection called "myringitis granulosa."

The bacteriological examination did not give conclusive evidence as to the causative factor; Gram negative cocci and bacilli were in the preponderance; the scarcity of pus cells indicated an inflammatory process of no great severity, confined to the superficial strata.

Although monilia spores were found only in the biopsy

section, fungi must be considered an important etiological factor, especially in the early state of the disease. This would explain the fact that myringitis granulosa is more prevalent during the summer months and in younger individuals who do a great deal of swimming. Myringitis granulosa is a chronic inflammation of the cutaneous layer of the drum which leads to formation of papillary excrescences of granulation tissue. It is the essayist's and other observers' opinion that it never penetrates through the lamina propia and stratum mucosum; therefore, one never finds a perforation of the drum. This is the most important point in the differential diagnosis of chronic otitis media and myringitis granulosa.

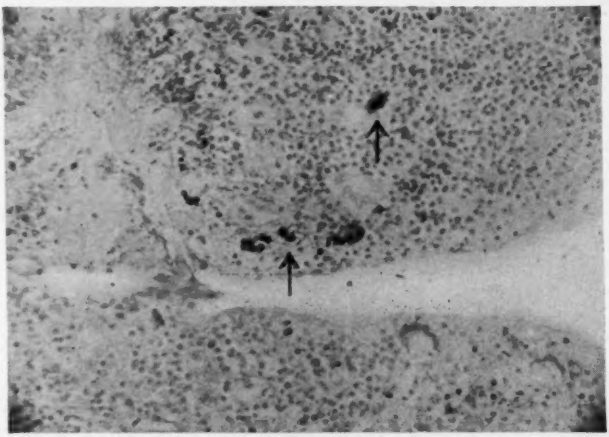

Fig. 3. Gram stain of the section showing clumps of monilia within the granulation tissue.

No impairment of hearing was noticed, even in those cases where the disease was of long standing, and the ear drum showed a general thickening. It would be pure speculation to state what the outcome would be in cases where no treatment is instituted. In all probability it might finally lead to a permanent, marked thickening of the drum with scar formation which might impair the hearing. The treatment of myringitis granulosa is simple, consisting of thorough cleansing and cauterization of the granula.

All the bacteriological and histological examinations were done by Dr. Kano Ikeda, pathologist of the Charles T. Miller Hospital, St. Paul, Minn.; I express my appreciation for his valuable assistance.

The drawing was done by Jean Hirsch, head of the medical art shop at the University of Minnesota.

641 Lowry Building.

THROMBOPHLEBITIS OF THE LATERAL SINUS, COMPLICATED BY PREGNANCY, WITH COMPLETE RECOVERY.

WM. E. SAUER, M.D., and DORIS SURLES WOOLSEY, M.D.,
St. Louis, Mo.

Thrombophlebitis of the lateral sinus is one of the most serious complications of otolaryngologic disease because it involves mostly young people, and because it is still fatal. Rosenwasser[1] recently reviewed the literature, and reported on 100 cases seen at the Mount Sinai Hospital; 90 of the 100 cases involved patients under 30 years of age, and there were 27 deaths.

Since lateral sinus thrombosis is found predominantly in the male sex, pregnancy as a complication is relatively rare. Jansen,[2] Meltzer,[3] Coates, Ersner and Persky[4] report that thrombophlebitis of the lateral sinus affects males three and one-half times as frequently as females. In Rosenwasser's series, there were no pregnancies, and 62 of the 100 cases were male.

With the advent of chemotherapy, and in particular, penicillin, first used by Florey and Florey[5] in the treatment of diseases of the ear, nose and throat, the number of recoveries from mastoiditis and its serious complications have increased. In presenting this case report, we agree heartily with Putney[6,7] that in order to effect a cure in the majority of cases of mastoiditis and its complications, adequate surgical intervention is necessary in addition to therapy with penicillin.

Due to the rarity of cases of lateral sinus thrombosis complicated by pregnancy, as well as toxic hepatitis and pyelitis, we felt justified in reporting the following case which recovered, and in which a normal, living child was delivered.

Editor's Note: This ms. received in Laryngoscope Office and accepted for publication, Sept. 5, 1945.

REPORT OF A CASE.

Mrs. A. J. L., age 29, a white, married female, was admitted to St. Mary's Hospital, Sept. 26, 1944. The patient was sent in as an emergency. She had had a chronic discharge from her right ear since she was eight years old, when she had measles. The discharge was described as yellow and of a very foul odor. There had been no pain in the ear since July, 1944, until Sept. 10, 1944, when, following a head cold, she had an acute onset of fever, pain, nausea, vomiting and headache. She was hospitalized and given sulfathiazole, but the pain over the mastoid region persisted, and she continued to have fever and chills. One week later, she was referred to another hospital, where sufathiazole was discon-

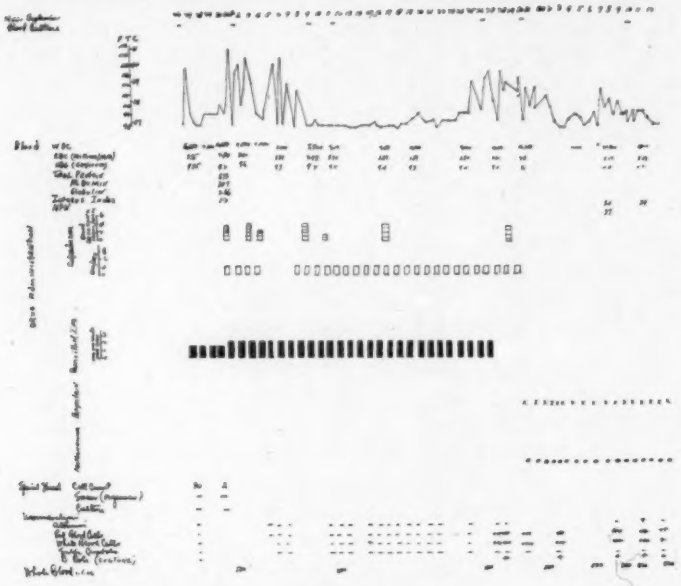

Fig. 1.

tinued and penicillin therapy was begun. In spite of this therapy, she continued to run a septic temperature, had chills daily and her general condition became much worse. She was then referred to us by Dr. Carlie Sauter Smith, Springfield, Mo.

The patient was five months pregnant and had had much nausea and vomiting during her entire pregnancy.

On admission, examination revealed a well developed white female, age 29, in very acute pain, localized over the right mastoid region. The temperature was 103.4° F., the pulse rate 120, and the respiratory rate 22. The neck was stiff. There was a positive Kernig sign and a positive

Brudzinski sign. Over the right mastoid region was found marked tenderness. There was a total destruction of the right tympanum. No ossicles were visualized. The external auditory canal was filled with a thin, brownish, very foul-smelling discharge. Both pupils were small, but round, regular and equal. On ophthalmoscopic examination marked

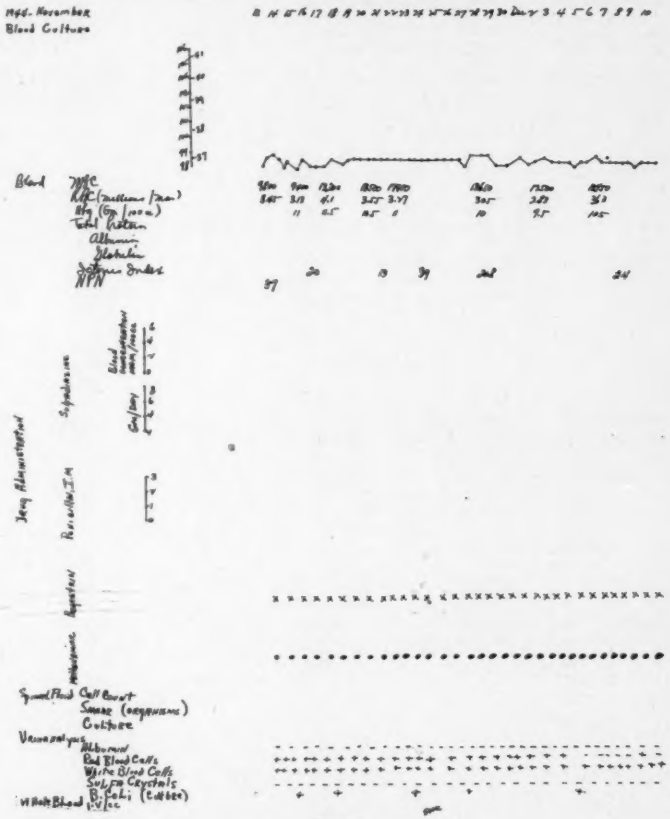

Fig. 2.

bilateral papilloedema was found and the retinal vessels were engorged. Cranial nerves were intact. Heart and lungs negative; breasts full. On abdominal examination, a hard, round mass could be felt which extended almost up to the umbilicus. Fetal heart sounds were heard in the left lower quadrant.

Admission urinalysis was negative except for an occasional white blood cell. The red blood cell count was 3,750,000 per cmm., the hemo-

globin content was 65 per cent, and the white blood cell count was 16,950 per cmm., with 34 per cent stab forms and 43 per cent segmented forms. The bleeding time was 1.5 minutes. The clotting time was 1.75 minutes.

Roentgen examination of the right mastoid revealed a mastoid of the diploetic cell type with a suspicious area of decreased density suggestive of destruction. There was some haziness over the entire right mastoid as well as the lateral sinus.

Shortly after admission, the patient was prepared for operation. Under cyclopropone-oxygen anesthesia, a radical mastoid was done, using the postauricular approach. Upon removal of the cortex, much pus, debris and cholesteatomatous material was found in the mastoid cavity. The sigmoid groove was opened, and bone was adherent to the lateral sinus. There was a large clot in the lateral sinus, and upon opening the sinus, foul-smelling pus was obtained. Free bleeding was then obtained from the torcular and bulbar ends. The sinus was packed off with iodoform gauze. The usual plastic of the external auditory canal was done.

While the patient was still on the operating table, a lumbar puncture was done. The spinal fluid was slightly turbid, and contained 30 polymorphonuclear leucocytes. A smear and a culture of the fluid were negative.

Postoperative Course: Immediately following operation, the patient was given 50,000 units of penicillin every four hours, intramuscularly. On the second postoperative day she began to have chills, run a septic temperature of 99° F. to 105.5° F., and to complain of severe occipital headache. A blood culture taken on this day was reported negative. On the fourth postoperative day, sulfadiazine was given as well as the penicillin. The white blood cell count was 11,500 per cmm., with 7 per cent stab forms and 77 per cent segmented forms. The wound was dressed and the iodoform gauze removed. In the next nine days the patient continued to chill, but on the tenth day she was afebrile and remained free of fever until the twenty-ninth postoperative day. During this time the mastoid wound had healed externally, and there was very little drainage from the external auditory canal, into which sulfanilamide powder was insufflated daily. Her course at this time was uneventful except for some generalized headache which was relieved by codeine. Daily urinalysis was negative for white blood cells, red blood cells and sulfa crystals. On her thirty-second postoperative day she began to complain of severe backache, pain in both lower quadrants, and she had a rise in temperature to 102° F. Consultation was held with Dr. Grey Jones, a gynecologist, who found tenderness in both costovertebral angles, and definite contractions of the uterus at irregular intervals. At this time a catheterized specimen of urine showed many white blood cells, and red blood cells. Blood examination revealed a total white blood cell count of 14,400 cells per cmm., with 67 per cent neutrophils. In view of the urinary findings, Dr. George Koenig, a urologist, was consulted, who cystoscoped the patient. He found many white and red blood cells in both ureters. Cultures revealed a heavy growth of B. coli. At this time, all sulfa drug was discontinued and the patient was given methenamine. Dr. Jones prescribed an oral progestrin which was given daily until discharge from the hospital. In the next eight days, the patient continued to have a temperature elevation of around 102° F., and she was given two blood transfusions. On the thirty-sixth postoperative day, she began to complain of some watery vaginal discharge, inability to retain any ingested food or liquids, and marked distension of the abdomen. At this time it was noticed that there was a very definite icteric tint to the sclerae.

Due to the serious condition of the patient, a surgical consultation was held with Dr. Louis Rassieur. The impression was that the patient had a toxic hepatitis and a partial intestinal obstruction. Intravenous glucose, nasal oxygen and continuous suction drainage of the stomach were instituted. The patient's general condition was very poor for the next 10 days, and she was given blood transfusions at intervals. The ear drained very little at this time. By the forty-eighth postoperative day, the patient's jaundice had begun to clear, she was afebrile and able to retain a soft diet. She was cystoscoped for the fifth time on her sixty-fifth postoperative day, and examination of catheterized specimens from each ureter still revealed the presence of white blood cells. Her general condition began to improve remarkably well, and on Dec. 10, 1944, her eightieth postoperative day, she was discharged.

On Dec. 28, 1944, she was readmitted to the hospital in active labor. At this time the ear was dry and there were no otolaryngologic complaints. After a labor of nine hours, she was delivered of a normal, male infant. Blood and urine examinations were not remarkable on admission. After a very uneventful postpartum, she was discharged from the hospital on Feb. 2, 1945. When last seen the patient was in good health, and her ear was still free of any discharge.

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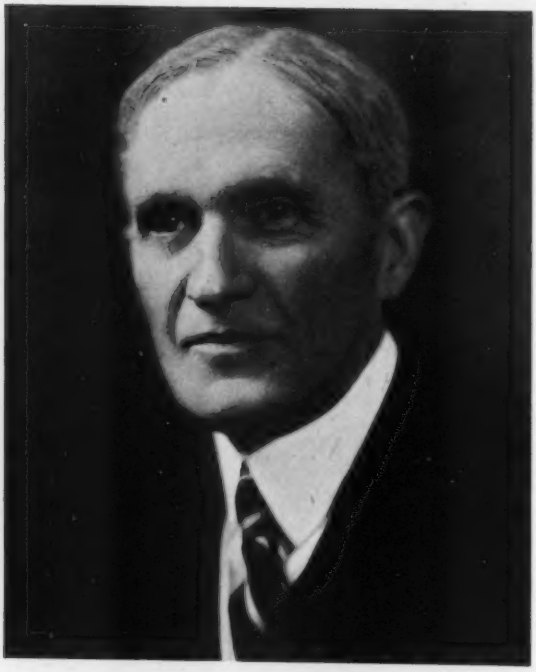

HORACE NEWHART, M.D.

IN MEMORIAM

HORACE NEWHART, M.D.,

1872-1945.

Dr. Horace Newhart, prominent otolaryngologist, died at Northwestern Hospital, Minneapolis, July 9, 1945, at the age of 72 years.

Born in New Ulm, Minn., Dec. 9, 1872, son of Jude and Sarah (Parker) Newhart, he attended Carleton College, at Northfield, Minn., received his A.B. degree from Dartmouth College in 1895 and his M.D. degree from the University of Michigan in 1898. He spent several years in postgraduate work in Vienna before entering private practice in Minneapolis in 1901.

He was professor of otolaryngology at the University of Minnesota and a member of the staff of the University, Northwestern, Abbott and St. Barnabas Hospitals and at Glen Lake Sanatorium.

Since 1925 he served as consulting otolaryngologist for the Minneapolis public schools and it was through his efforts that periodic hearing tests were made on the school children.

In 1924, he was honored with the presidency of the American Academy of Ophthalmology and Otolaryngology; in 1925, he was elected president of the Minneapolis Society for the Hard of Hearing; in 1927, this same honor was conferred upon him by the American Society for the Hard of Hearing, and in 1939 the American Otological Society chose him as its president.

His numerous articles on the medical topics of his specialty and his outstanding efforts in the cause of the hard of hearing placed him high in the esteem of his otological colleagues.

He was a faithful attendant at the meetings of the national societies in his field of medicine as well as those of the national societies devoted to the teaching of speech to the deaf and for the correction of speech abnormalities.

He is survived by his widow, Mrs. Anne Hendrick Newhart, his son, Elwood, and sister, Grace, to whom we offer our heartfelt sympathy in their loss.

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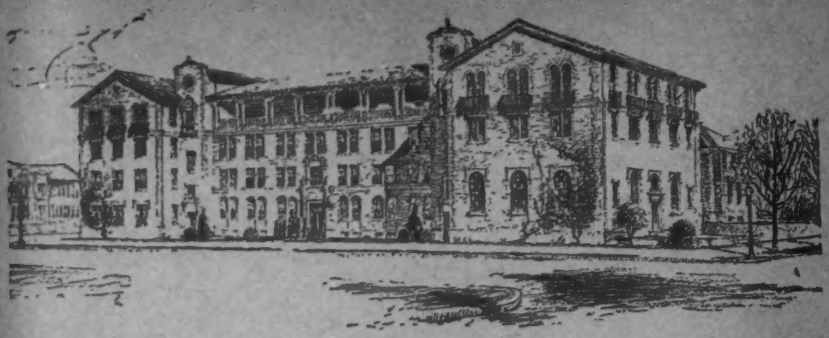

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